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ICNAF Res.Doc.70/54ANNUAL MEETING - JUNE 1970Preliminary study of redfish from commercial catches of Saint Pierre

by P.Y.Hamon
ISTPM, Saint Pierre

The three trawlers of SPEC (Société de Pêche et de Congélation) of Saint Pierre exploit a very large area including Div.4R, 4S, 4Vn, 3Pn and 3Ps of ICNAF. The redfish catches of these trawlers has increased since 1961.

1961	1962	1963	1964	1965	1966	1967	1968	1969
800	900	1,200	1,300	1,400	1,400	2,400	2,600	2,800

The catches are expressed in tons. The main divisions exploited are 3Ps and 4R.

Method

It is very difficult to make an exact scientific work from Saint Pierre commercial catches. At the beginning of our work, it was impossible to know the exact source of the fish; even the depth appeared uncertain. This latter factor is of great importance in the case of redfish. According to Sandeman (1969), there is a stock of redfish in rather deep water made up of small individuals, and a stock in deeper water made up of larger individuals. Another factor must be considered: commercial trawlers discard individuals below a certain size - 20 cm for redfish. The sample is therefore automatically biased, and the absence of small sizes prevents a study of recruitment.

From November we have been able to obtain - thanks to the cooperation of the management of SPEC and the vessel captains - only one complete and well marked trawl haul, to be put aside for a more elaborate study. The only valuable and usable scientific information comes from November and December. From these data we have established length-weight curves and von Bertalanffy equations.

The results, as we will see, are not very conclusive, because we have not been able to follow month by month the catches from the same location; under these conditions it is impossible to follow the evolution of a stock during different seasons of the year, in a single division. From the data we possess we can only record our observations.

Each sample contained a minimum of 900 fish, the maximum measured being 6,400, representing a complete trawl haul. The first studies carried out on the sample showed that 800 measurements gave a good idea of the three-hour haul, constituting about 6,000 redfish.

The measurements were made from the tip of the lower jaw, mouth closed, to the extremity of the longest caudal fin. Our measurements are therefore slightly greater by one to two centimetres than the American and Canadian measurements made only to the caudal fork. In addition to total length, certain more precise measurements, such as the diameter of the eye, head length, post- and pre-orbital length have been made for a later study; some otoliths have been removed and weights recorded.

The 65,000 fish measured in 1969 belonged to the species *Sebastes marinus mentella* (Travin, 1951).

ICNAF statistics for the divisions where the SPEC trawlers operated are given below in tons:

	3Ps	3Pn	4R	4Vn
1961	8,340	1,060	3,927	4,826
1962	11,306	2,132	1,609	3,576
1963	11,150	2,597	6,908	2,746
1964	9,919	4,688	9,967	2,430
1965	9,931	8,802	20,155	2,867
1966	16,543	4,525	33,057	3,067
1967	28,463	4,526	30,855	1,989
1968	9,406	2,951	43,304	7,512

Only Div.4R shows a steady increase in catch; the highest yields in the division are made from July to November.

In 1968, McCracken wrote that "The study of juveniles in Div.4R-S-T is of great interest because they appear after a period of 8 years during which time recruitment in the area was negligible and at a time when the stocks of old redfish are almost depleted."

In 1969, the same author wrote of the same region that the catches have continued to increase and that "many juveniles have located on the bottom in different parts of the Gulf; the slight decline in the fishery in 1969 is not dramatic and will not be of long duration."

Samples from Div.4R were taken in April, September and November, and 21,700 individuals measured. Figures 1 and 2 show the absence of small sizes, a mode of 30 cm and minimum and maximum sizes of 18 and 48 cm respectively.

However we cannot conclude from our observations that juveniles are absent, the mesh sizes permitting small sizes to escape; because although these meshes only measure 60 mm on one side, many fish can escape when the "panneaux" of the trawlers of the type used by SPEC are placed in position.

The mode does not seem to vary during the year. A 22 cm group was weakly represented in November.

Div.4Vn is very different from Div.4R (Fig. 3 and 4). The mode is established at 32 cm.

Regarding Div.3P, Templeman (1968) reports important catches of young redfish on the southwest slope of the Grand Bank. This presence of juveniles is a hope for the future because the catches in this area have been in sharp decline.

Our study has been carried out essentially in Div.3Ps. Samples of uncertain origin have been discarded and we have retained only 5 hauls which were made in January, September, November and December (Fig. 5 and 6). The mode is situated at about 32 cm and the minimum and maximum sizes are 12 and 46 cm respectively.

A simple statistical study using the calculation of the average, of the variance, and of the deviation shows certain great differences. The average is calculated from the formula:

$$\bar{x} = \frac{\sum fx}{n}$$

The variance
$$s^2 = \frac{\sum fx^2 - n\bar{x}^2}{n - 1}$$

Deviation
$$s = \sqrt{s^2}$$

If we put the results obtained into a table, writing the extreme values obtained for each division, we have:

	4R	4S	4Vn	3Ps
\bar{x}	29,735	31,005	32,852	30,965
	30,802	32,387	35,300	33,280
$\sqrt{s^2}$	4,956	5,610	9,653	12,050
	6,636	7,988	15,236	17,151
\sqrt{m}	2,226	2,368	3,106	3,471
	2,523	2,826	3,903	4,141

Analysis of this table shows the differences existing among the divisions. In Div.4R the average and the mode coincide. An important fact which does not appear in this table should be noted. In Div. 3Ps the average shows two distinct values, one of 30 and the other 33 cm, and, on the other hand, the curves (Fig.5 and 6) show the presence of a 23 cm group in November.

L'imprécision des fiches de marée prevents us from making the slightest supposition about differences between and within divisions. The depth, the geographic position and perhaps both together play a large role. It would be interesting to find and follow the 23 cm group. The next cruise of N/O *Thalassa* on Saint Pierre Bank will certainly permit the collection of more precise data.

It should be noted that the variations in Div.4R and 4S are between 4 and 7 and that those of Div.4Vn, 3Pn and 3Ps have extreme values of 9 and 17. One may conclude that, for the divisions studied, the variations are weak to the north of Cabot Strait, and strong to the south of this strait. Concerning the formula of variation, one sees that in our experience the quantity (n-1) always being very large, only the numerator, therefore the total of squares of deviations from the average, may explain the differences which we find. If to the north of Cabot Strait the result is weak, it is that the numerator itself is weak, that the deviations from the average are not important and that the extent of distribution is not as great in the north as in the south of this strait. This is also clearly shown on the general curve (Fig.7).

If arbitrarily, one takes as limits the sizes of 24 and 37 cm, one calculates that the amount of fish - of which the size is less than 24 cm and above 37cm - is 3% of the total to the north of the strait, and 14% to the south. The fishery in Div.4R is therefore not yet critical because there are old groups and juveniles exploitable in a few years seem to be represented; confirmation of this theory will be one of the objectives of our next cruise.

Homogeneity tests, as well as analysis of variation, will only provide supplementary information. For the results to be useful, it would be necessary to regroup these data by depth zones and to be certain of the fishing position; as mentioned above, the information gathered does not allow us to draw valuable conclusions.

Sex Ratio

Templeman (1959) gives the following "scheme": in January, February, March and April, the females are less numerous than the males; in May, June the females are less abundant than the males between 93 and 200 m, the number of females increases progressively and reaches 50% and more at 250 m. In July, August, November and December, the females are more numerous generally than the males. In September and October, the females are absent between 200-230 m.

Our samples do not show the annual development, but verify that in Div.4R there are as many males as females in September and November; the mode is slightly higher for females (Fig.8). Females are less numerous in July and August in Div.4Vn, the modes differing by two to three centimetres (Fig.9). In Div.3Ps, in November and December, females are still less numerous than males, the modes differing by two to five centimetres (Fig.10). In this figure the 23 cm group is clearly seen.

Length-Weight Curve

After having been separated by length and sex, the redfish were weighed by two different methods, on the one hand, by series of 10 specimens of the same group on a sensitive balance; one easily finds the average weight. On the other hand, the entire group was weighed on a coarser balance, and one calculates again the average weight; the variations between the two results are about ten grams at the most. The length-weight curves thus obtained and adjusted have allowed us to calculate for Div.4R and 4Pn the parameters of the relation:

$$W = Q L^n \quad (1)$$

in which W is the weight in grams, Q is a constant, L is length (our measurements were made from the tip of the lowerjaw, mouth closed, to the end of the longest caudal fin).

To solve equation (1), one translates it into the logarithmic expression:

$$\text{Log } W = \text{log } Q + n \text{ log } L$$

The two unknowns are Q and n. Establishing a system of two equations with two unknowns gives the following:

Div.3Ps:	males	$W = 0.01747 L^{3.15}$
	females	$W = 0.01330 L^{3.01}$
Div.4R	males	$W = 0.02440 L^{2.8}$
	females	$W = 0.01000 L^{3.01}$

These equations were established for the month of December 1969.

von Bertalanffy Equation

The otoliths are broken then burnt; one examines them with the aid of a binocular microscope (x 20). All the material studied was collected on Saint Pierre Bank in December 1969.

The von Bertalanffy equation

$$L_t = L_\infty \left\{ 1 - e^{-k(t-t_0)} \right\}$$

was solved by the Walford graphic method, the results are naturally less precise than those given by the Thomlinson and Abramson method. Since our readings are not very numerous, and our samples have been made only in the month of December, it would be unrealistic to expect to achieve much precision with as little data. This is why the Walford graphic method, described by Ricker (1958), has appeared to us, at this time, to be the best. The results obtained for females are the following:

$$L_\infty = 42.2 \quad K = 0.83 \quad t_0 = 1.3$$

Conclusion

Analysis of the data furnished from the commercial catches does not permit furnishing new elements. The cruise of N/O *Thalassa* and the cruises of N/O *Cryos* will allow us to give more precise elements, and covering the whole year. The results obtained in 1969 should only be considered as the first stage of a more important study.

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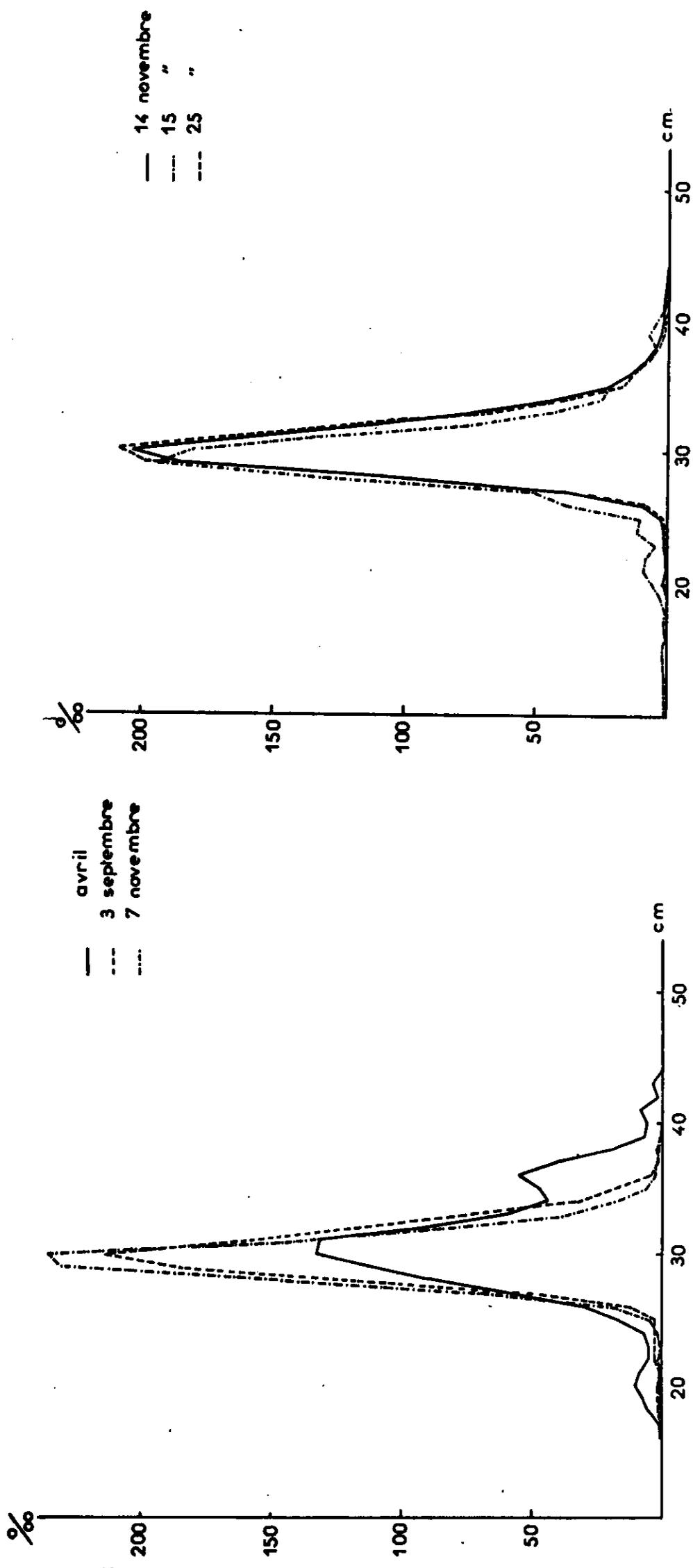


Fig. 1 and 2. Length frequency - redfish - Div.4R - April, September and November.

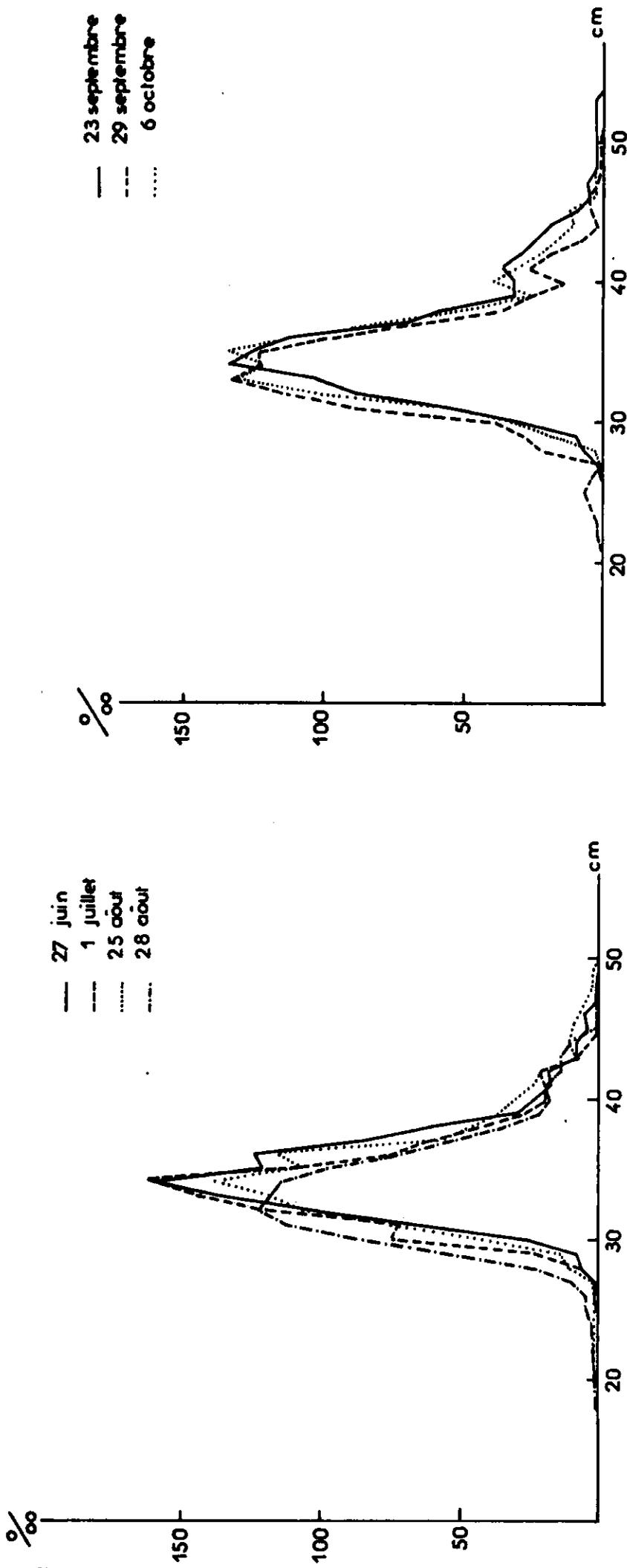


Fig. 3 and 4. Length frequency - redfish - Div.4Vn - June, July, August, September and October.

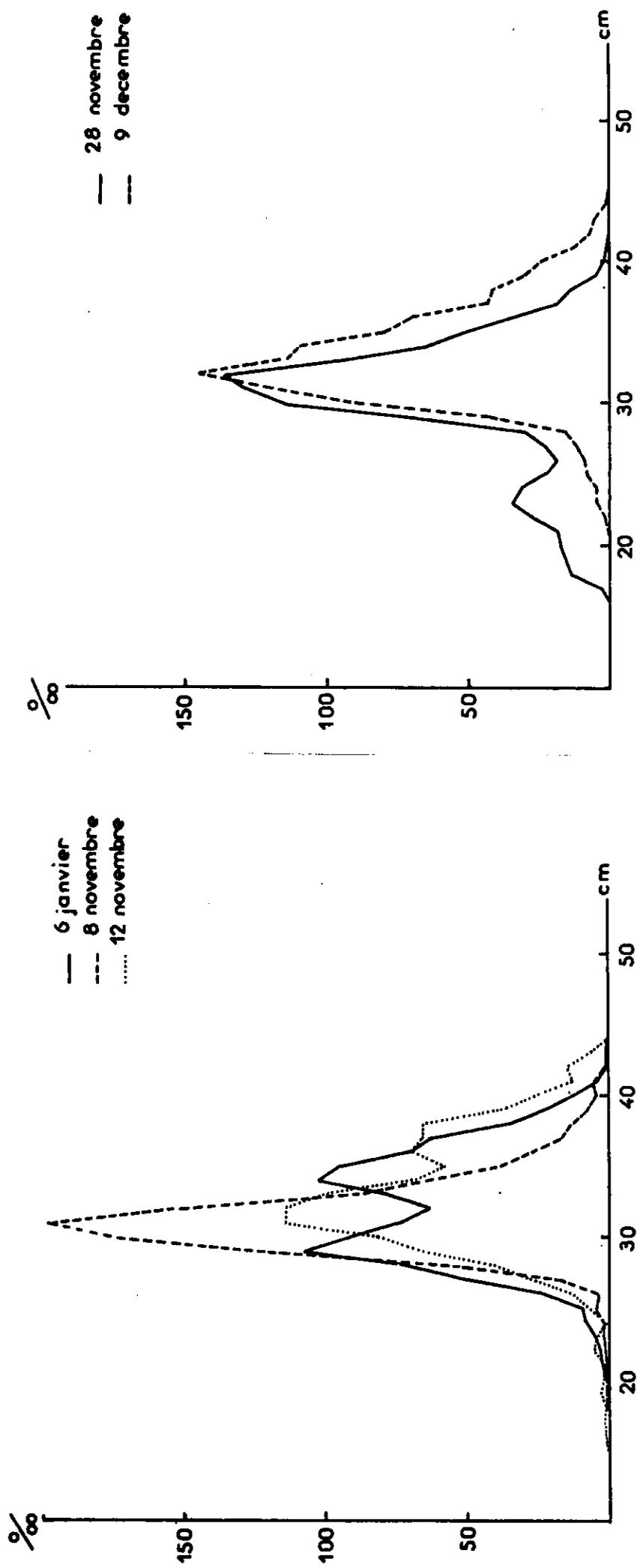


Fig. 5 and 6. Length frequency - redfish - Div. 3Ps - January, November and December.

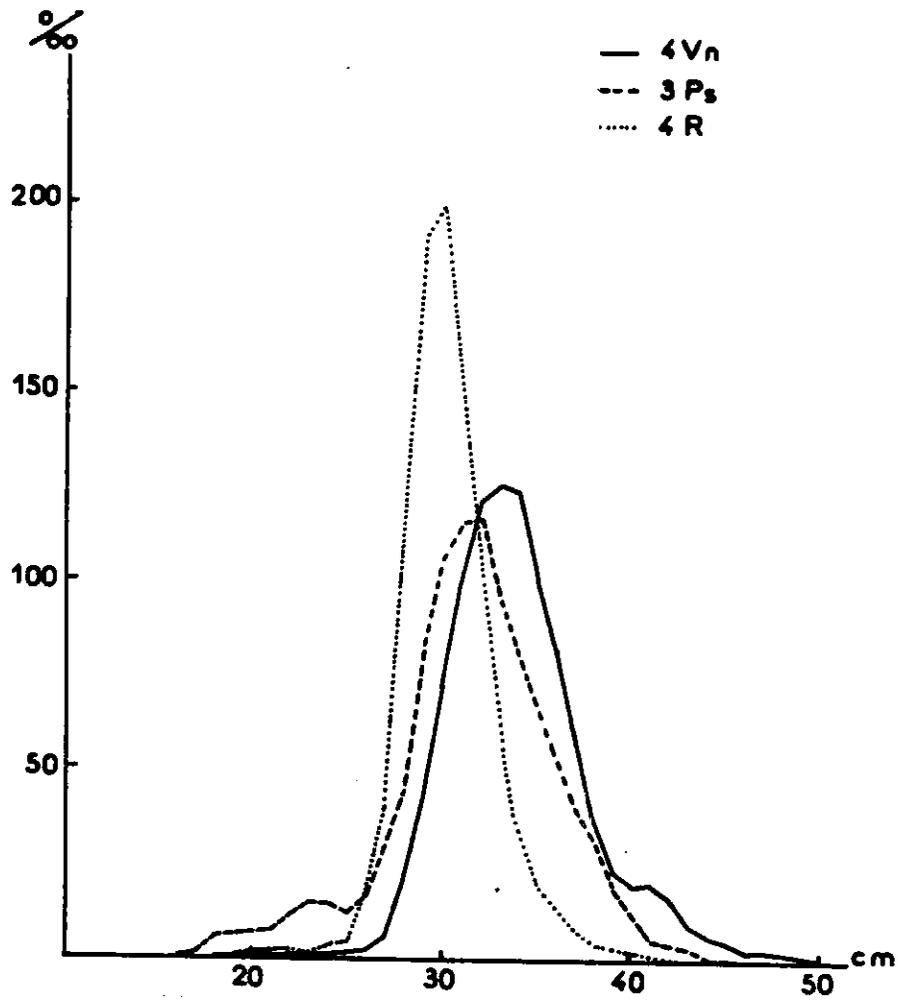


Fig. 7. Length frequency - redfish - Divs.4R, 4Vn and 3Ps - during 1969.

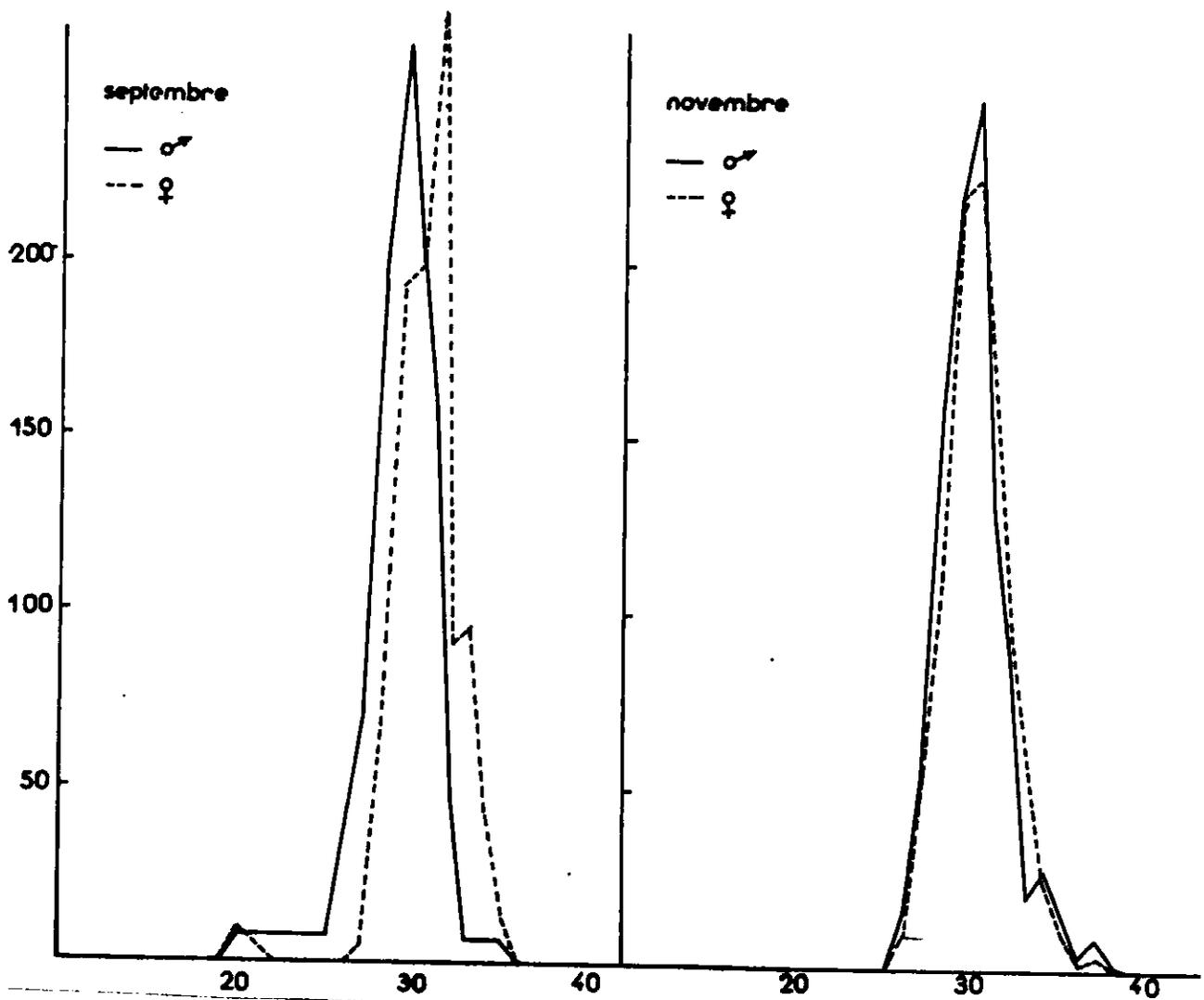


Fig. 8. Length frequency - male and female redfish - Div.4R - September and November.

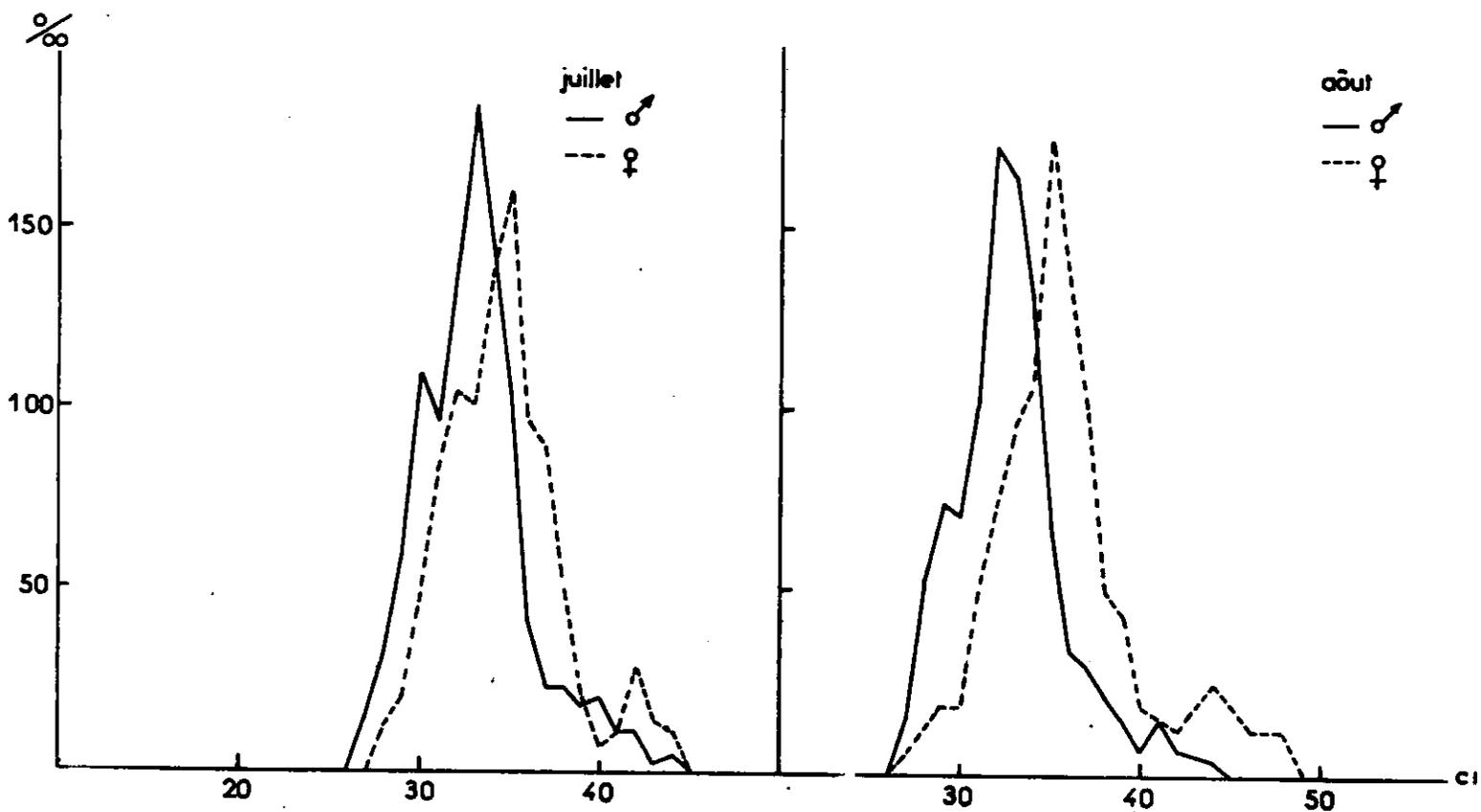


Fig. 9. Length frequency - male and female redfish - Div.4Vn - July and August.

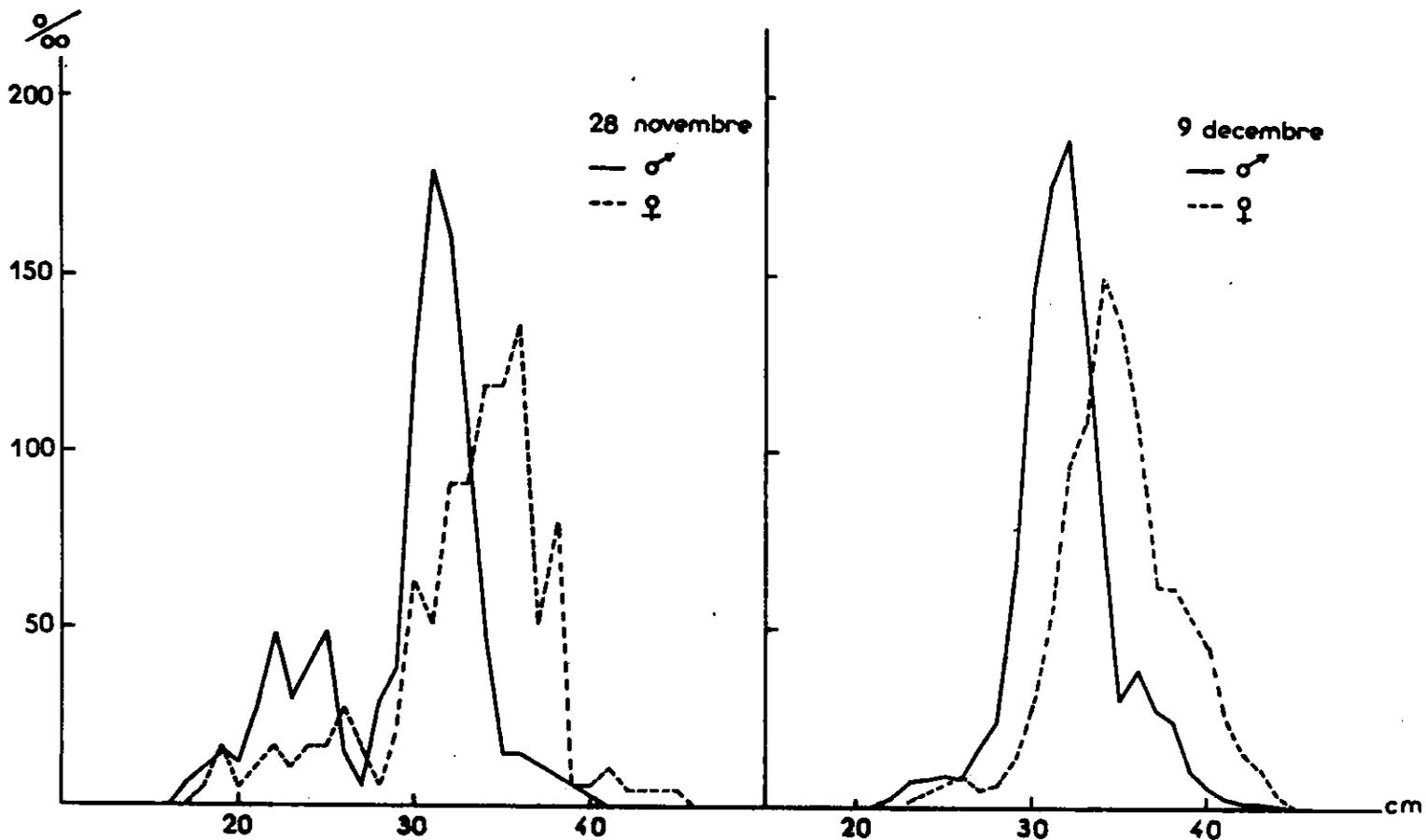


Fig.10. Length frequency - male and female redfish - Div.3Ps - November and December.